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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHN F. GRUBB

Appeal 2010-003866
Application 10/602,945
Technology Center 1700

Before CHUNG K. PAK, BEVERLY A. FRANKLIN, and
LINDA M. GAUDETTE, *Administrative Patent Judges*.

PAK, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134(a) from the Examiner's refusal to allow claims 36 through 40, 42, and 43, all of the claims pending in the above-identified application.[1] We have jurisdiction under 35 U.S.C. § 6.

STATEMENT OF THE CASE

The subject matter on appeal is directed to "a ferritic stainless steel alloy" suitable for various high temperature applications, such as current collecting interconnects in solid oxide fuel cells, furnace hardwares, equipment for the chemical processes, etc. (Spec. 1, ll. 19-26). Details of the appealed subject matter are recited in representative claim 36[2] reproduced from the Claims Appendix to the Appeal Brief as shown below:

> 36. A solid oxide fuel cell comprising:
>
> an anode;
>
> a cathode;
>
> an electrolyte comprising stabilized zirconia, wherein the electrolyte is intermediate the anode and the cathode; and
>
> an interconnect providing a current pathway from the anode, the interconnect comprising a ferritic stainless steel comprising:
>
> greater than 25 weight percent chromium,
>
> 0.75 up to 1.5 weight percent molybdenum,
>
> up to 0.05 weight percent carbon, and

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[1] *See* Appeal Brief ("App. Br.") filed July 6, 2009, 3-4; Reply Brief ("Reply Br.") filed November 30, 2009, 2; and Examiner's Answer ("Ans.") filed October 1, 2009, 2.

[2] Appellant only argues the limitations of claim 36. Therefore, for purposes of this appeal, we select claim 36 and decide the propriety of the Examiner's § 103(a) rejection set forth in the Answer consistent with 37 C.F.R. § 41.37(c)(1)(vii).

> at least one of niobium, titanium, or tantalum, wherein the weight percentages of niobium, titanium, and tantalum satisfy the equation
>
> $$0.5 \leq (\%Nb + \%Ti + 1/2(\%Ta)) \leq 1,$$
>
> wherein the steel has a coefficient of thermal expansion within about 25 percent of the coefficient of thermal expansion of stabilized zirconia between 20°C and 1000°C and exhibits at least one creep property selected from the group consisting of creep rupture strength of at least 1000 psi at 900°C, time to 1% creep strain of at least 100 hours at 900°C under load of 1000 psi, and time to 2% creep strain of at least 200 hours at 900°C under load of 1000 psi.

As evidence of unpatentability of the claimed subject matter, the Examiner relies on the following prior art references at page 2 of the Answer:

Woods, Jr.	US 5,424,144	June 13, 1995
Simpkins	US 6,613,468 B2	Sept. 2, 2003
Taruya	JP 2000-294256	Oct. 20, 2000[3]

Appellant requests review of the Examiner's rejection of claims 36 through 40, 42, and 43 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Simpkins and Taruya, as evidenced by Woods. (*See* App. Br. 12 and Reply Br. 3.)

RELEVANT FACTUAL FINDINGS, PRINCIPLES OF LAW, ISSUES, ANALYSES, AND CONCLUSIONS

Appellant does not question the Examiner's finding that Simpkins teaches a solid oxide fuel cell comprising an anode, a cathode, an electrolyte comprising stabilized zirconia located intermediate the anode and the cathode, and an interconnect providing a current pathway from the anode. (*Compare* Ans. 3 *with*

[3] Our reference to this patent is to the corresponding English translations of record submitted by the Examiner and Appellant.

App. Br. 13-27 and Reply Br. 4-18.) Nor does Appellant dispute the Examiner's finding that the interconnect taught by Simpkins can be made of ferritic stainless steels which "may be coated with LSC [(strontium-doped lanthanum chromite)] or strontium-doped lanthanum manganite (LSM) to achieve the same desired properties [as an interconnect comprising lanthanum chromite doped with an alkaline earth element]." (*Compare* Ans. 3 and 6 *with* App. Br. 20; *see also* Simpkins, col. 6, ll. 60-66.)

Appellant contends that one of ordinary skill in the art would not have been led to employ the claimed interconnect comprising a particular stainless steel as the interconnect of the solid oxide fuel cell taught by Simpkins. (*See* App. Br. 13-23 and Reply Br. 4-15.) In support of this contention, Appellant argues that there is no reason or suggestion to employ the stainless steel interconnect taught by Taruya as the stainless steel of the interconnect taught by Simpkins and no reason or suggestion to employ at least one of niobium, titanium or tantalum in the weight percentage defined by the claimed formula, e.g., 0.5 to 1.0 weight percent of niobium and/or titanium. *Id.* Appellant also argues that Taruya does not suggest a stainless steel that necessarily has one of the functionally defined creep properties listed in claim 36. (*See* App. Br. 22-23 and Reply Br. 7-10.)

The first critical question raised by the Examiner and Appellant is: Has the Examiner reversibly erred in determining that one of ordinary skill in the art would have been led to employ the claimed interconnect *comprising* a particular stainless steel as the interconnect of the solid oxide fuel cell taught by Simpkins? On this record, we answer this question in the negative.

As correctly found by the Examiner at pages 3 and 4 of the Answer, Taruya in its English abstract describes a polymeric electrolytic fuel cell employing a separator (corresponding to the claimed interconnect) comprising a ferrite stainless

steel made of, *inter alia*, 10.5 to 35 weight percent of chromium, 0 to 6 weight percent of molybdenum, no more than 0.018 weight percent of carbon, not more than 0.2 weight percent of titanium, and not more than 0.3 weight percent of niobium. Consistent with this finding, Taruya also exemplifies a stainless steel sample No. 5 having, *inter alia*, 25.6 weight percent of chromium, 0.98 percent molybdenum, 0.0013 weight percent of carbon, and 0.12 weight percent of titanium, with a statement that niobium is an element that is included as needed (*See* Table 1 of the English translations of record submitted by both the Examiner and Appellant, with Appellant's English translation, para. 0049.)

Given the fact that Simpkins teaches using an interconnect *comprising* any known conventional stainless steels, inclusive of that taught or suggested by Taruya, we find no reversible error in the Examiner's determination that one of ordinary skill in the art would have been led to employ the claimed particular stainless steel taught or suggested by Taruya as at least part of the interconnect[4] of the solid oxide fuel cell taught by Simpkins within the meaning of 35 U.S.C. § 103(a). This is especially compelling in this case since Woods Jr., as correctly found by the Examiner at pages 4 and 5 of the Answer, evidences that one of ordinary skill in the art knew at the time of the invention that a conductive ferrous metal separator (e.g., a conductive ferritic stainless steel interconnect) is generally used for "known types of fuel cells, such as solid oxide fuel cells and polymer electrolyte fuel cells." (*See also* Wood, col. 1.)

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[4] As correctly determined by the Examiner at page 6 of the Answer, the term "comprising" used in the context of the interconnect recited in claim 36 does not preclude the presence of the coating material taught by Simpkins. *In re Baxter*, 656 F.2d 679, 686-87 (CCPA 1981) (The transitional term "comprising" in a claim is interpreted as not precluding the presence of additional ingredients and/or steps, which are not recited in that claim.)

In reaching this determination, we have fully considered Appellant's argument at pages 16 through 21 of the Appeal Brief that the ferritic stainless steel interconnect used in Taruya's polymeric electrolytic fuel cell is not interchangeable with the same component of the solid oxide fuel cell taught by Simpkins. In support of this position, Appellant refers to paragraphs 0005 and 0006 of Taruya and column 1 of Woods Jr. (App. Br. 16-21.). However, as correctly found by the Examiner at pages 5 and 6 of the Answer:

> [T]he disclosure at [0005] [of Taruya] is related to interchanging the electrolyte, fuel electrode and/or oxide electrode materials of different fuel cell types. This section of Taruya does not discuss interconnect materials. Furthermore, [0006] [of Taruya] discusses not utilizing phosphoric acid fuel cell or molten carbonate fuel cell materials for polymer electrolyte fuel cells. Simpkins teaches a solid oxide fuel cell having an interconnect that is electrically conductive and comprises a ferritic stainless steel material (6:46-67). Taruya teaches a polymer electrolyte fuel cell comprising a ferrite stainless steel interconnect (abstract). Woods teaches a ferrous metal separator is generally used for known types of fuel cells, such as solid oxide fuel cells and polymer electrolyte fuel cells (column 1). Therefore, one of skill would have known that ferrous stainless steel interconnects could have been used for SOFCs [(i.e., solid oxide fuel cells)] (taught by Simpkins and Woods) or polymer electrolyte fuel cells (taught by Taruya and Woods).

More importantly, however, Simpkins teaches that ferritic stainless steels, inclusive of the ferritic stainless steel taught or suggested by Taruya, are useful as part of the interconnect of its solid oxide fuel cells as indicated *supra*.

Relying on his English translation of Taruya, Appellant, at page 15 of the Appeal Brief and pages 5 and 6 of the Reply Brief, states that Taruya actually teaches or suggests a ferritic stainless steel having smaller percentages of titanium and niobium than the percentages of the same relied upon by the Examiner, that is, less than 0.2 weight percent of titanium, rather than no more than 0.2 weight

percent of titanium, and less than 0.3 weight percent of niobium, rather than no more than 0.3 weight percent of niobium. In other words, Taruya does not suggest a ferritic stainless steel having the claimed total percentage of titanium and niobium. (App. Br. 15 and Reply Br. 5-6.) However, regardless of which English translation prevails in this case, the fact remains that the total percentage of titanium and niobium suggested by Taruya either touches or is very close to the claimed total percentage (0. 5 weight to 1.0 weight percent) of the same. As our reviewing court stated in *In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003):

> In cases involving overlapping ranges, we and our predecessor court have consistently held that even a slight overlap in range establishes a *prima facie* case of obviousness. . . . We have also held that a *prima facie* case of obviousness exists when the claimed range and the prior art range do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 783 . . . (Fed. Cir. 1985).

Having determined that Taruya would have suggested the claimed ferritic stainless steel interconnect as indicated *supra*, we concur with the Examiner that its associated properties, such as at least one of the functionally defined creep properties listed in claim 36, would have naturally flowed from such suggestion. S*ee In re Kubin*, 561 F.3d 1351, 1357 (Fed. Cir. 2009) ("Even if no prior art of record explicitly discusses the [limitation], [applicants'] application itself instruct that [the limitation] is not an additional requirement imposed by the claims on the [claimed invention], but rather a property necessarily present in [the claimed invention]"); *Ex parte Obiaya*, 227 USPQ 58, 60 (BPAI 1985) ("The fact that appellant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious."); *see also In re Papesch*, 315 F.2d

381, 391 (CCPA 1963) ("From the standpoint of patent law, a compound and all of its properties are inseparable; they are one and the same thing.")

Appellant contends that the claimed subject matter imparts unexpected results relative to the closest prior art. (*See* App. Br. 23-27.) In support of this contention, Appellant relies on the data discussed at pages 21 through 29 of the Specification. *Id.* On the other hand, the Examiner has found that Appellant has not demonstrated that the showing in the Specification is directed to a comparison between the claimed subject matter and the closest prior art and is reasonably commensurate in scope with the degree of protection sought by claim 36. (*See* Ans. 7.)

Appellant can rebut a *prima facie* case of obviousness by showing "unexpected results," *i.e.,* showing that the claimed invention possesses a superior property or advantage that a person of ordinary skill in the art would have found surprising or unexpected. *See In re Geisler*, 116 F.3d 1465, 1469 (Fed. Cir.1997) (quoting *In re Soni*, 54 F.3d 746, 750 (Fed. Cir. 1995). However, the burden rests with Appellants to establish, *inter alia*, (1) that the comparisons are to the disclosure of the closest prior art, and (2) that the supplied evidentiary showing is commensurate in scope with the claimed subject matter. *See In re Klosak*, 455 F.2d 1077, 1080 (CCPA 1972).

Thus, the second critical question raised by the Examiner and Appellant is: Has Appellant demonstrated that the showing in the Specification is directed to a comparison between the claimed subject matter and the closest prior art and is reasonably commensurate in scope with the degree of protection sought by claim 36 on appeal? On this record, we answer this question in the negative as well.

As acknowledged by Appellant at page 24 of the Appeal Brief, the showing in the Specification is limited to the ferritic stainless steel compositions listed in Table 1at page 21 of the Specification. Table 1 is reproduced below:

Heat	WC70	WC71	WC72	WC73	WC74	WC75
C	0.0026	0.0026	0.0038	0.0022	0.0023	0.0033
Mn	0.054	0.055	0.060	0.049	0.052	0.053
P	0.010	0.010	0.010	0.010	0.010	0.010
S	0.0029	0.0027	0.0014	0.0011	0.0003	0.0006
Si	0.16	0.15	0.14	0.15	0.15	0.15
Cr	25.52	25.98	25.63	25.77	25.69	25.79
Ni	0.096	0.094	0.095	0.094	0.094	0.095
Mo	1.05	1.05	1.03	1.04	1.04	1.04
Al	0.002	0.002	0.002	0.002	0.002	0.002
Nb	0.12	0.68	0.13	0.68	0.71	0.71
Ce	<0.001	<0.001	0.001	0.003	0.042	0.009
La	<0.001	<0.001	0.001	0.001	0.016	0.003
Zr	<0.001	<0.001	<0.001	<0.001	<0.001	0.011
N	0.0010	0.0010	0.0008	0.0009	0.0011	0.0011

These ferritic stainless steel compositions were prepared by specific multiple treatments under specific conditions (Spec. 21-22). The Specification indicates that WC 70 and WC 72 are typical ferritic stainless steels supposedly representative of the closest prior art and WC 71, WC 73, WC 74 and WC 75 are ferritic stainless steels within the claimed subject matter (*id.* at 21). These ferritic stainless steel compositions contain different amounts of carbon, manganese, phosphorus, sulfur, silica, chromium, nickel, molybdenum, aluminum, niobium, cerium, lanthanum, zirconium, and nitrogen and do not contain titanium as shown in Table 1.

On this record, we concur with the Examiner that the showing in the Specification does not include any meaningful comparison (i.e., side-by-side experimental evidence) between the claimed invention and the closest prior art (Taruya), holding all variables constant except for the novel features of the claimed invention (i.e., the recited weight percentage range of titanium versus the percentage of titanium in the same ferritic stainless steel sample No. 5 exemplified

by Taruya). *See In re Baxter Travenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991) ("[R]esults must be shown to be unexpected compared with the closest prior art.") Nor does the showing in the Specification include the differently prepared ferritic stainless steel compositions containing different proportions of different metals, including titanium, in addition to chromium, molybdenum, and carbon, embraced by claim 36 on appeal as indicated by the Examiner. *See, e.g., In re Harris*, 409 F.3d 1339, 1344 (Fed. Cir. 2005) ("Even assuming that the results were unexpected, Harris needed to show results covering the scope of the claimed range. Alternatively Harris needed to narrow the claims."); *In re Greenfield*, 571 F.2d 1185, 1189 (CCPA 1978) ("Establishing that one (or a small number of) species gives unexpected results is inadequate proof, for 'it is the view of this court that objective evidence of non-obviousness must be commensurate in scope with the claims which the evidence is offered to support.'") (quoting *In re Tiffin*, 448 F.2d 791, 792 (CCPA 1971)). The need for the claims to be commensurate in scope with the showing is particularly compelling in this case since it is not clear from the showing whether the alleged improvements are due to the claimed novel feature or unclaimed features such as different proportions of carbon, manganese, phosphorus, sulfur, silica, chromium, nickel, molybdenum, aluminum, cerium, lanthanum, zirconium, and nitrogen in the ferritic stainless steels compared.

Accordingly, based on the totality of record, including due consideration of the arguments and evidence relied upon by Appellant in the Appeal Brief and Reply Brief, we determine that the preponderance of evidence weighs most heavily in favor of obviousness of the subject matter recited in claims 36 through 40, 42, and 43 within the meaning of 35 U.S.C. § 103.

ORDER

In view of the foregoing, it is

ORDERED that the decision of the Examiner to reject claims 36 through 40, 42, and 43 under 35 U.S.C. § 103(a) as unpatentable over the combined disclosures of Simpkins and Taruya, as evidenced by Woods is AFFIRMED; and

FURTHER ORDERED that no time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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